Federal Aviation Administration

Memorandum

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To: All Manufacturing Inspection Offices
All Manufacturing Inspection District/Satellite Offices
All Certificate Management Offices/Units
All Flight Standards Divisions
All Flight Standards District Offices

From: Frank P. Paskiewicz, Manager, Production and Airworthiness Division, AIR-200

Prepared by: Airworthiness Certification Branch, AIR-230

Subject: ACTION: Restrictions on the Issuance of Airworthiness Certificates (Including Amendments) for Me-262 (Messerschmitt) Replica Aircraft

This memorandum discusses the issuance of experimental certificates for the Me-262 (Messerschmitt) replica aircraft for the purpose of operating as an amateur-built aircraft under Title 14, Code of Federal Regulations (14 CFR) § 21.191(g) or as an experimental exhibition aircraft under 14 CFR § 21.191(d).

In 1999, the owner of the first Me-262 replica aircraft attempted to certificate the aircraft as an amateur-built aircraft under 14 CFR § 21.191(g). However, the FAA determined that the aircraft was ineligible and issued an airworthiness certificate as experimental exhibition under 14 CFR § 21.191(d). Since 2002, several replicas of the Me-262 have been built by Classic Fighter Industries, Inc., in Everett, Washington. To date, two completed aircraft are flying, and three other aircraft are available for sale from the manufacturer.

Unresolved issues with the Me-262 replica aircraft may preclude the issuance of an airworthiness certificate without additional and aircraft-specific operating limitations. Any application for an Me-262 replica aircraft experimental certificate for the purpose of operating as an amateur-built aircraft or an experimental exhibition must first be coordinated with AIR-200 for additional guidance. AIR-200 will coordinate with the respective Flight Standards (AFS) offices to define the steps to be taken. AIR-200 and AFS may assist in the evaluation process.

Please distribute this memorandum to all Designated Airworthiness Representatives (DAR).

If you have any questions, please contact the Airworthiness Certification Branch, AIR-230, at (202) 385-6346.

Me-262

Background

Unlike former U.S. military aircraft, the Me-262's construction techniques, adherence to acceptable manufacturing and construction processes, and reliability, cannot be ascertained. In fact, some are know to be safety of flight issues. The aircraft was reverse-engineered from an original captured Me-262 owned by the U.S. Navy. The Me-262 IS NOT a former military aircraft that would have benefited for many years or decades of operational, maintenance and support experience, like a T-33 or an L-39 for example. This is not a "standard" homebuilt RV-8 with a Lycoming IO-360 either where standard amateur-built flight testing procedures and data collection suffices. The Me-262 is a very complex 12-000lb+, swept wing, twin-jet powered aircraft with minimal flight test time. The replica is based on an aircraft that documentation shows was not fully flight tested but rather rushed into production and combat with several serious safety of flight defects. Many of the defects in the original ME-262 used to as a template for the replica in question were actually purposely reproduced to enhance the "authenticity" of these new production Me-262 replicas.

Although the manufacturer of the Me-262 replica has improved upon several of the aircraft's original safety deficiencies (i.e. new J-85/CJ-610 powerplants v. original 900 kp Jumo 004, new brakes, new tires and other sub-systems), the fact remain that several known problems were "re-encountered" during early flight testing of the new replicas since 2002. Within the first hours of flight testing, the aircraft had an accident and suffered malfunctions of almost every critical system (powerplant, generators, brake, hydraulic, landing gear, trim and flap systems). Indeed, the aircraft's manufacturer, Classic Fighters, Inc., only conducts minimal flight testing before delivery to "customers." For example, only 9 flights (less than 9 hours) were conducted before D-IMTT (the aircraft that went to Germany) was delivered to the "customer" after it was "pronounced ready…" However, in Germany, the aircraft, which only has the equivalent of an R&D airworthiness certificate, has only appeared at limited air show venues, does not carry passengers, must operate VFR and can only be flown by a limited number of experienced test pilots.

Known Safety Issues

The following is a summary of the safety and airworthiness information AIR-230 has compiled so far on the Me-262. This information is relevant to the FAA's consideration of the aircraft's basic airworthiness.

1. High-speed controllability

   - q High Mach number testing incomplete.
   - q Postwar tests in the West and in the Soviet Union confirmed that at very high airspeeds airframe vibration levels and buffeting grow increasingly worse until the jet enters into a shallow dive and becomes all but completely uncontrollable.
   - q Critical Mach 0.83-0.86 and thus a restriction in the operating limitations of Mach 1 is not adequate. Compressibility is strongly apparent at 0.75.
   - q Above 500 knots, flight controls become ineffective in all three axis, thus the statement by the manufacturer that "in the interest of safety, the Me 262 Project will be placing a placarded airspeed limitation upon the jets in the vicinity of 500 MPH" may have to be revised downward.
   - q Nose-down pitch moment at high speed, pitch down and speed increasing with no effective flight control (including trim) or throttle position to affect recovery ultimately leading to high-speed ground impact (see below) or airframe in-flight break-up due to divergence at high speed with limited crew survival possibilities if bail-out is attempted.
   - q Induced rudder oscillation ("snaking," small amplitude, short-period yawing oscillations) at approximately 380 knots, caused in part to lack of effect fin area (lack of

damping effect) and variations in rudder hinge movements. Turbulence could act as an exciter for induced rudder oscillation. This was never fully tested (see picture below).
- Unacceptable high stick forces, in the order of 88-110 lb., have been recorded.
- No acrobatic maneuvers are to be permitted due to the ease with which an overspeed condition can occur.

2. Un-resolved aileron control problems at medium speed ranges:

    - Airflow separation [aileron buzz], possibly between 280-and 350 knots.
    - High stick forces/aileron control forces excessive.
    - Overbalance and control-reversal tendencies.
    - Stick gearing (extended leverage) installation.
    - Possible aileron flutter upon wear of actuators.
    - Possible speed restriction of 350 knots.

3. Single-engine and V_{mc} problems:

    - Flight tests so far reference a "benign" V_{mc}.
    - Very high V_{mc} [160-180 knots+ while typical approach speed is 130-135 knots] at normal operating weights.
    - Because of the higher power of the modern powerplants (50%), V_{mc} would be higher than with the original powerplant.
    - New engines are more powerful than original but flight control authority most likely limits this benefit.
    - Some have reported critical single-engine characteristics (i.e. at 140 knots – violent diving turn when one engine is lost and corrective action within 2 seconds is needed).
    - Very high rudder forces required.
    - Single-engine landing was considered a hazard and to be avoided. Many pilots actually dead-stick landed the aircraft instead.
    - Aircraft must be Day VFR only.
    - Some level of testing consistent with 14 CFR Part 23.149 may be required to ensure safety, update the AFM and the LOA.

4. Critical horizontal stabilizer incidence control unit:

    - High speed flight required expert setting of the stabilizer incidence control unit.
    - Incidence control unit cannot be a remanufactured or repaired original unit. The unit installed in the actual flying aircraft must meet modern safety standards (i.e. 14 CFR Part 23.671-672, 25.603 or CAR 3equivalent), mil standard). It must be tested and reliable.
    - Its failure in flight can result in catastrophic and possibly irrecoverable pitch down.
    - Critical adjustment know-how is essential for safe flight.
    - Micro-switch reliability to stop stabilizer incidence control unit motor.
    - Secondary electrical power source may be required.
    - Circuit breaker reset procedures.

5. Possible rudder reversal with deflections in excess of 80%.
6. Aircraft flight control surfaces very sensitive to any mass changes (i.e. different thickness material) and this can affect the mass-balancing installation on the aircraft (see above).
7. Landing gear:

    - Overall, the landing gear structure is weak, not commensurate with the aircarft landing speeds and normal landing loads.

- Adherence to original Messerschmitt design is not necessarily a mitigating action because the original design was inherently weak to begin with.
- Repeated normal landings have weakened gradual deformation of landing gear components leading to failure. This justifies a recurrent landing gear system inspection (including a structural inspection) each time the aircraft completes 5 landings.
- N262AZ has an early-type nose gear fitted, no torque scissor link.
- Main gear misalignment was common.
- Un-commanded main landing gear extension leading to gear door separation and impact with engine.
- In-flight un-commanded main gear extension and wooden landing gear door separation and collision with engine nacelle due to landing gear system [too much play in the mechanical locking system] overstress at 3Gs. Thus, a limitation of 2.5Gs is recommended and possibly metal rather than wooden doors.
- Violent nose gear shimmy leading to structural damage.

8. Auxiliary trim tab may lead to vibration of the elevator.
9. Wing slats calibration and adjustment (i.e. possible asymmetric deployment). In 2004, during flight testing, minor structural adjustments had to me made to a forward slat to eliminate binding.
10. Elongated wing-to-fuselage attachment bolt holes.
11. Control rods driving the flaps were deficient:

    - Asymmetric installation and different softness.
    - Inboard flap deformations.
    - Flap flutter has been documented.

12. Poor structural workmanship overall including:

    - Torn fuselage panels.
    - Cracks in elevator push rods.
    - Wing dissymmetry

13. Poor manufacturing and assembly processes including:

    - Adherence to 1944 manufacturing standards in initial sub-component manufacturing.
    - Aluminum on Steel paring throughout the wing [especially in the wing spar and its attach points/spar cap areas].
    - Manufacturing inaccuracies on wing contour as much as 0.3."
    - Poor riveting.
    - Wing misalignment (lack of jigs).

14. Original design had one hydraulic tank on the right wing and one hydraulic pump on the left wing.

15. Acrobatics were not to be permitted in the original POH, yet current operating allowed them.

16. Very sensitive W& B (i.e. caution and procedures established in aft fuel tank used).

17. Powerplant

    - Difficulties in replacing and integrating new powerplant such as "hang up" events requiring detailed and professional intake flow modifications for example.
    - Consider fire detection/suppression.
    - Firewall installation.
    - Use J-85 and CJ-610 manufactures inspection and maintenance procedures.

Review of flight and maintenance discrepancies the aircraft has had since 2002 [these have occurred in earlier flight testing within 20-25 hours] and verify corrective action. These included:

- In-flight un-commanded main gear extension.
- Violent nose gear shimmy even with original designed built-in shimmy dampers.
- Tire specifications.
- GCUs (Generator Control Units).
- Electrical system malfunctions.
- Brake system malfunctions – sensitivity, locking up or weak braking action) caused by the Messerschmitt main brake cylinder mated to the Grumman S-2 system).
- Flap motor malfunctions.
- Trim system malfunctions (drive failure and runaway trim).

18. Brake and hydraulic malfunctions very historically and in testing the existing aircraft.

19. Formation Flying

    - Me-262 test pilot reported difficulties with station keeping with the B-24 bomber because of speed deferential and reported finding "myself hanging somewhat sluggishly and with fully extended slats alongside the bomber…."

20. Increase Phase I and Phase II testing to 40 hours. No passengers are to be carried in Phase I and II.

These safety issues should be incorporated into Phase I and Phase II testing. They should be properly tested, results and corrective/mitigation actions documented. After Phase II, the FAA would review the data and decide then how much additional operation experience (i.e. 75-100 hours) is necessary to validate that the aircraft has no hazardous characteristics, and ensure a consistent reliability of all of the aircraft and its systems. Only then would the FAA be able to reconsider a petition for exemption to allow the carrying of passengers.

Additional Operating Limitations

In addition to the safety issues discussed above (or any others identified upon review of additional information), and if the FAA is satisfied after the end of Phase II, the following operating restrictions should be imposed on the operation of the aircraft:

General

- No air shows before completion of Phase II.
- Required 75-100 hours of air show/exhibition/cross country experience beyond Phase II before paying passengers are carried and establish acceptable reliability data.
- Conduct a risk assessment on the operation of the aircraft based on Phase II results.
- Establish a pilot and passenger training program to include emergency procedures and egress.

Aircraft and FAA Actions

- Detailed and recurrent structural and systems inspection by qualified personnel (i.e. A&P, engineering reports) after 10 hours of flight and submit findings, mitigation and corrective action to FAA.

Flight Limitations

- VFR Day only.

- Ø No acrobatic maneuvers of any kind (30° of pitch or 60° of bank). Only straight and level, shallow turns, shallow banks (i. e. 20°).
- Ø 2.5 G limitation.
- Ø Speed limitation of 350 knots if aileron and rudder vibration/buffeting issues are resolved. Otherwise, speed limit at 250 knots.
- Ø No high speed passes and minimum altitude of 1,000 feet.
- Ø No formation flying or simulated "gun" passes at other aircraft.
- Ø No flights over populated areas, including take-off and landings.